The Madras Agricultural Journal

Vol. XLI | JULY 1954 | No. 7

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Editorial

For successful plant growth, especially, on large areas as in agricultural or plantation crops where a single variety may occupy large and continuous tracts the problem most imminent is the control of pests and diseases. For, if a pest or a disease appears in one part it is easy for it to spread over the whole area in a short time since a uniform host is available uninterrupted. They then attain an epidemic form unless they are checked early and serious losses may result. To combat these, various measures have been adopted in the past. The most frequent measure against diseases have been one of prevention by spraying of chemicals etc , and of breeding a resistant variety. In the case of pests it is again one of destruction of and prophylaxis against possible future attacks. Chemical treatments and biological control methods have been usual. Most agricultural crops are annual whereas the plantation crops are perennial. Thus in the battle for preservation of the plant a constant vigilence and fight has to be kept up. It is possible that in either instance the pest or the disease may disappear temporarily and reappear when favourable situations obtain. R. L. Piemeisel has reviewed (Bot. Rev. 1954; vol. 20; no. 1 ; p. 1–50) a measure which is not so well known as the ones mentioned above. This measure has been called "Replacement control". This is a measure which employs indirect means of getting rid of pests through changes in vegetation. This involves replacement of weeds and other vegetation by other more desirable, useful and resistant species. These new plants are, so to say, strangers to the pests and diseases and thus are not attacked by them during the seasons when the susceptible crop is off the field. Thus there is considerable reduction in the pests and diseases for want of an alternate host. The replacement itself is not so easy nor can it be done in a short time. Careful selection of the plant species to form communities has to be done. Numerous difficulties of course arise in such whole-sale replacement of existing communities. One is aware in India the

seriousness of pests like the aphids, jassids etc. These are known to live on the grasses growing near the cultivated field and transported to the crops during the crapping season. Considerable difficulties have been experienced in controlling them. In such cases the replacement control deserves a serious trial. A graphic illustration has been given of such a control. In this instance destruction by man of large areas of vegetation in semidesert areas led to the inhabitation of the marginal lands by certain weeds which were suitable hosts for the beet leaf hopper. These multiplied and obtained plague proportions and travelled from sugar beet to other crops like tomatoes, beans etc. This hopper was a carrier for a virus which caused curly leaf top and thus spread the virus from plant to plant. The replacement control measure brought this under effective check. Thus the agriculturist has in his hands another valuable measure of control of pests and diseases and calls for careful consideration of the species of plants that are utilised in planting up of new areas and at the same time being useful as fodder etc.

Fertiliser Studies with Potatoes — *(Studies on the reduction of manure without detriment to crop yield or the productivity of the soil*

By

M. SANYASI RAJU, S. VARADARAJAN & Mrss. V. K. KUNJAMMA
Agricultural Chemistry Section, Agricultural Research Institute, Coimbatore

Introduction: The potato cultivation in this State, unlike in most of the other States, is confined mainly to the hills of Nilgiris, barring some few hundreds of acres in Kodaikanal and Hosur. The climate of the Nilgiris being equitable and mild, the potatoes can be grown throughout the year. However, the most favourable season is March to June. The total area as per the latest available statistics is about 19,500 acres with an yield of over 52,000 tons. The area under cultivation has steadily been increasing since 1923–'29 when it was fluctuating between 8,111 and 8,644 acres. In 1930–'31 it was 10,600 acres but rose gradually to 15,400 acres in 1937–'38 and to 19,500 in 1945–'46 which level is being maintained at present. The object of the experiment was to study the possibilities of reducing the dosage of manure for growing potatoes in the Nilgiris without impairing the efficiency of yields or the productive capacity of the soil.

Soil Condition: The soils of the Nilgiris are of laterite origin. They are open soil though the clay content is high, deficient in lime (0·04 to 0·09%), and are acidic, pH ranging from 4·5 to 5·2. The sesquioxide content is very high, iron and alumina varying from 7 to 10% and 11 to 15% respectively. These and the lateritic nature of the soils render the added phosphate unavailable and therefore require large doses of it.

Further, the slopes on which potato is grown coupled with high rainfall results in washing out of the soluble manures and hence high doses of manures have to be applied to secure good yields. Therefore, experiments were designed to cut down the manurial bill without impairment of either the yields or the productive potentiality of the soils.

Materials and Method: The Great Scot variety of potato which is the most popular and high yielding one on these hills, was grown.

Treatments:

(a) *Two rates of nitrogen application:*

(1) 40 lb. of nitrogen per acre in the form of ammonium sulphate and groundnut cake.

(2) 80 lb. of nitrogen per acre as above.

(b) *Three levels of P_2O_5 and no phosphoric acid:*

(1) No P_2O_5 application.

(2) 40 lb. of P_2O_5 in the form of superphosphate and bone meal.

(3) 120 ,, ,,

(4) 200 ,, ,,

(c) *Lime vs. No lime application:*

(1) No lime application.

(2) Lime at 2 tons per acre (slaked lime).

(d) *All plots received potash at 100 lb. K_2O per acre as potassium sulphate.*

This was a complex manurial experiment of 2×4×2=16 treatments. Each treatment was replicated 8 times resulting in 128 plots. Each plot consisted of 6 rows—20 feet in length by 12' width or 0·55, cents in area. All the plots received a basal dressing of 5 tons of cattle manure at the time of preparation of the field for the lay out. There were two series of plots in the same field with identical treatments so that in three seasons, three crops of potato could be raised with the usual rotation followed on the hills :—

	Series I	Series II
I year:	potato — Lupin	Samai — Lupin
II year:	samai — Lupin	Potato — Lupin
III year:	potato — Lupin	Samai — Lupin

Soil Analyses: Samples of soils from the field were taken at three depths viz. 0–12", 12"–24" and 24" to 36" before the beginning of the experiment in 1949 for complete machanical and chemical analyses (vide table III). The soil contained on an average 0·167% of nitrogen, 0·013% of available P_2O_5 and 0·0096% af available K_2O with a total lime content of 0·114% and organic carbon content of 1·77%. The soil reaction was pH 5·52.

Samples of soils were also collected from all the plots immediately after the harvest of potatoes in all the three years and

analysed for nitrogen, total lime, total and available P_2O_5, organic carbon and pH. The methods as described in A. O. A. C. was adopted for all analyses except for organic carbon for which Walkley and Black's method was adopted.

Results: Three crops of potatoes were raised during the three years of trial. The yield data are presented in table I. The statistical interpretation of the yields are given in table II. The data on the analysis of soil samples taken after the harvest of the potatoes to study the changes in the productive capacity of the soil are presented in tables IV and V. The formula of the usually prescribed manure applied to potatoes, known as the Nanjanad mixture, is given below :—

Groundnut cake 500 lb.; Ammonium sulphate 200 lb.; Concentrated super 336 lb.; Steamed bone meal 224; Potassium sulphate 224 lb.

The first crop of potatoes raised in 1949 gave an average yield of 15,240 lb. per acre in the plots receiving 80 lb. nitrogen, 200 lb. phosphoric acid and 100 lb. potash, which is the control used for comparing the yields when the different ingredients were reduced systematically. From the yield data it is seen that (1) the effect of liming was not in any way significant on the yields. In fact lime had a depressing effect on the high levels of phosphoric acid and nitrogen. Eighty pound dose of nitrogen proved superior to 40 lb. dose of the same. The yield response to phosphoric acid increased proportionately with higher doses of the ingredient. However, there was no significant variations in yield due to the various combinations of the manurial ingredients used.

The second crop raised in 1950 gave a poor yield due to the failure of seasonal rains. The yield recorded in the whole of the Nilgiris was generally low. The average yield of potatoes receiving the maximum quantity of nitrogen and phosphoric acid was only 8,860 lb., a figure about 56% of the first year's yield from plots receiving similar treatments. The yield was statistically significant to the main effects of phosphoric acid and its interactions with nitrogen only. The effect due to other treatments were not significant. In the second year also the yield due to phosphoric acid increased with the dosage.

The third crop of potato planted in 1951 gave an average yield of 10,000 lb. per acre in the plots receiving the Nanjanad

mixture. The data reveal that higher doses of nitrogen in combination with the higher doses of phosphoric acid have given increased yields. There are indications that when the level of nitrogen was low, lime had better influence. This is evidently due to the effect of lime in rendering the insoluble organic nitrogen present in the soil to nearly 0·2% available to the growing crop. Again it was seen that phosphoric acid gave increased yield as the dosage was raised.

The statistical examination of the yield data revealed that there was significance for the main effects of nitrogen and phosphoric acid only. The effects due to other treatments were not significant. Limed plots did not give any better yield than the unlimed plots.

Soil analyses indicate that the fertility status of the soil after potato harvest had improved. There was not much variation in the different treatments. The summary of results are given in table VI.

Conclusions: From the three years trials the following conclusions may be drawn. (1) The higher the dose of nitrogen the greater is the yield of potatoes. (2) The yield of potatoes increases with the increase in dosage of phosphoric acid. (3) Lime by itself or in conjunction with either nitrogen or phosphoric acid does not influence to any great extent the yield of potatoes. (4) There is no indication to show that there was any impairment to the fertility status of the soil after a crop of potato.

Summary: (1) Experiments were conducted with potatoes to see the yield relationship with the different levels of nitrogen and phosphoric acid alone and, in combination with lime, for three years.

(2) The tangible conculsion derived from the trials is that the Nanjanad mixture with 80 lb. of nitrogen, 200 lb. of phosphoric acid and 100 lb. of potash seems to contain the minimum of ingredients necessary for good yield of potatoes on the hills and no further reduction in either the nitrogen or phosphoric acid seems possible consistent with good yields.

(3) Lime, even at two tons per acre, which would tell on the cost of manuring to a high degree, never gave any sizable increase in the crop yield and hence seems unnecessary in the existing scheme of manurial practice.

Acknowledgments: The experiment was designed and started by late P. D. Karunakar with the object of reducing the manurial bill of the potato cultivators of the Nilgiris. The authors' thanks are due to the Superintendent, Agricultural Research Station, Nanjanad for all the help rendered in the conduct of the trials. They are also indebted to Sri C. Raghavendrachar who analysed the soils of the experimental plots prior to the commencement of the experiment and to and Sri S. Subramaniam who attended to certain operations in the conduct of the trials. Thanks are also due to the Government of Madras for sponsoring a scheme to carry out the studies for three years.

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TABLE I. Average yield of potatoes in the different series during the three years of experiments

Treatment (Ingredients in lb. per acre)			1949 — '50		1950 — '51		1951 — '52	
Nitrogen	Phosphoric acid	Potash	Unlimed	Limed	Unlimed	Limed	Unlimed	Limed
80	200	100	15,240	13,880	8,660	7,865	11,450	10,718
80	120	100	14,280	14,340	6,705	7,956	9,850	10,442
80	40	100	12,580	11,360	7,342	7,478	9,707	9,137
80	0	100	8,908	10,070	4,999	4,000	7,051	7,341
40	200	100	14,010	15,250	6,887	7,820	9,661	10,273
40	120	100	13,140	13,900	6,842	8,569	9,160	10,436
40	40	100	11,140	10,470	5,862	6,744	7,992	8,124
40	0	100	7,745	9,051	5,047	6,138	6,188	7,380

TABLE II. Complex Manurial Experiments—(Potatoes) Summary of Results

FIRST YEAR (1949—1950) LIME VERSUS NO LIME

Particulars	Mean Yield of Potatoes		General Mean	S. E. of Treatment	Whether Significant or Not	Critical Difference P = 0·05
	Lime	No lime				
Yield in Pounds per acre ..	12,290	12,130	12,210	253·4	No	—
As percentage on general mean ..	100·7	99·3	100	—	—	—
As percentage on control ..	101·4	100	—	—	—	—

Conclusions: Yields Not significant for lime.

NITROGEN

Particulars	Mean Yield of Potatoes		General Mean	S. E. of Treatment	Whether Significant or Not	Critical Difference P = 0·05
	1N	2N				
Yield in Pounds per acre ..	11,840	12,580	12,210	253·4	Yes	710·9
As percentage on general mean ..	96·9	103·0	100	—	—	—
As percentage on control ..	100	106·3	—	—	—	—

Conclusions: 2N, 1N.

TABLE II *(Contd.)*

PHOSPHORIC ACID

Particulars	Mean Yield of Potatoes				G. M.	S. E.	Significant or Not *P = 0·05	C. D.
	OP	1P	3P	5P				
Yield in Pounds per acre ..	9,910	11,390	13,920	14,600	12,455	358·3	Yes	852·3
As percentage on general mean ..	79·5	91·4	111·7	117·1	100	—	—	—
As percentage on control ..	100	114·9	140·5	147·3	—	—	—	—

Conclusions: 5P, 3P, 1P, OP

SECOND YEAR (1950—1951) The yield in the experiment was significant for the main effect of P_2O_5 and its interaction with nitrogen. All other main effects and interactions were not significant.

PHOSPHORIC ACID

Particulars	Mean Yield of Potatoes				G. M.	S. E.	Significant or Not	C. D.
	OP	1P	3P	5P				
Yield in Pounds per acre ..	5,224	7,119	7,784	8,093	6,811	304	Yes	852·3
Percentage on G. M. ..	76·7	104·5	114·3	118·8	100	—	—	—

Conclusions: 5P, 3P, 1P, OP

TABLE II *(Contd.)*

THIRD YEAR (1951—1952) Experiment significant for main effects of nitrogen and phosphoric acid only.

PHOSPHORIC ACID

Particulars	OP	1P	3P	5P	G. M.	S. E.	Significant or Not	C. D.
Yield in pounds per acre	6,982	7,993	8,217	9,181	8,092	275·0	Yes	824·4
Percentage on general mean	86·3	98·8	101·5	113·5	100	—	—	—

Conclusions: 5P, 3P, 1P, OP

NITROGEN

Particulars	1N	N2	G. M.	S. E.	Significant or Not	C. D.
Yield in pounds per acre	7,257	8,928	8,092	184·0	Significant	573·2
Percentage on general mean	89·8	110·4	100	—	—	—

Conclusion: 2N, 1N

TABLE III. Showing the results of soil analysis of the Experimental Plots, Agricultural Research Station, Nanjanad (Nilgiris)

Serial No.	HEADS OF ANALYSIS	Major Plot 1 0—12″	Major Plot 2 0—12″	Major Plot 3 0—12″	Major Plot 4 0—12″
	MECHANICAL COMPOSITION				
1.	Clay	56·82	63·39	59·48	49·52
2.	Silt	17·50	15·70	14·09	16·16
3.	Fine sand	8·97	8·39	8·66	8·18
4.	Coarse sand	16·85	13·59	17·95	24·19
	Total	100·14	101·07	100·18	98·05
	CHEMICAL COMPOSITION				
1.	Loss on ignition	11·70	11·94	13·46	15·78
2.	HCl insolubles	57·85	56·58	55·46	51·76
3.	Al_2O_3	18·50	19·92	19·52	20 65
4.	Fe_2O_3	10·87	10·54	10·43	10·17
5.	CaO	0·135	0·115	0·104	0·104
6.	MgO	0·285	0·388	0·254	0·200
7.	K_2O	0·679	0·706	0·414	0·307
8.	Na_2O	0·253	0·283	0·141	0·204
	Total	100·27	100·47	99·78	99·18
9.	So_3	0·084	0·068	0·067	0·080
10.	P_2O_5 (total)	0·187	0·191	0·196	0·188
11.	Nitrogen	0·177	0·134	0·154	0·203
12.	Available K_2O	0·014	0·008	0·007	0·010
13.	Available P_2O_5	0·008	0·007	0·019	0·017
14.	pH	5·33	4·93	5·80	5·91

TABLE IV. Summary of Results of Post-Harvest Soil Analysis—1949—1950—Surface Soils (percentages)

Treatment Pounds Ingredient per acre			UNLIMED SERIES						LIMED SERIES					
			pH	Nitrogen %	Total P_2O_5 %	Available P_2O_5 %	Lime %	Organic Carbon %	pH	Nitrogen %	Total P_2O_5 %	Available P_2O_5 %	Lime %	Organic Carbon %
N	P_2O_5	K_2O												
40 ÷	0 ÷	100	5·04	0·193	0·185	0·021	0·137	1·81	5·28	0·161	0·176	0·023	0·217	1·91
40	40	100	5·08	0·207	0·171	0·015	0·156	2·00	5·36	0·164	0·182	0·010	0,177	2·13
40	120	100	5·06	0·192	0·173	0·020	0·120	1·88	5·45	0·184	0·197	0·016	0·174	2·27
40	200	100	5·22	0·182	0·272	0·022	0·157	2·24	5·36	0·192	0·208	0·020	0·186	2·14
80	0	100	5·26	0·206	0·267	0·022	0·141	2·26	5·28	0·199	0·184	0·034	0·197	2·63
80	40	100	5·24	0·202	0·243	0·022	0·211	2·50	5·14	0·180	0·202	0·021	0·198	2·30
80	120	100	5·28	0·199	0·191	0·024	0·136	2·27	5·31	0·189	0·194	0·023	0·252	2·29
80	200	100	5·29	0·180	0·168	0·023	0·190	2·22	5·08	0·167	0·193	0·016	0·203	1·74
	Average ..		5 20	0·195	0·221	0·021	0·156	2·00	5·10	0·180	0·192	0·022	0·201	2·10

TABLE V. Summary of results of post harvest soil analysis 1950 — '51 surface soil

Treatment Pounds ingredients per acre			UNLIMED SERIES (Percentages)						LIMED SERIES (Percentages)					
N	÷ P_2O_5	÷ K_2O	pH	Nitrogen	Total P_2O_5	Available P_2O_5	Lime	Organic carbon	pH	Nitrogen	Total P_2O_5	Available P_2O_5	Lime	Organic carbon
40	0	100	4·92	0·173	0·231	0·018	0 154	1·56	5·00	0·154	0 200	0·014	0·201	1·96
40	40	100	5·00	0·168	0·173	0·021	0·163	1·43	5·18	0·170	0·204	0·015	0·196	1·77
40	120	100	5·08	0·151	0·208	0·014	0·137	1·36	5·64	0·160	0·157	0·020	0·193	1·62
40	200	100	5·20	0·141	0·172	0·020	0·181	2·00	5·30	0·135	0·201	0·017	0·157	1·51
80	0	100	5·40	0·160	0·219	0·014	0·187	1·60	4·50	0 150	0·206	0·013	0·196	1·90
80	40	100	5·18	0·165	0·190	0·016	0·200	1·75	5·00	0·128	0·161	0·018	0·187	1·87
80	120	100	4·99	0·159	0·186	0·013	0·152	1·48	5·20	0·160	0·190	0·016	0·198	2·01
80	200	100	5·34	0·164	0·197	0·011	0·142	1·95	5·10	0·161	0·193	0·012	0·200	1·68
	Average		5·15	0·156	0·200	0·016	0·190	1·70	5·11	0·152	0·190	0·016	0.191	1·80

TABLE VI. Showing the results of soil analysis both before and after cropping — average values

Heads of analysis	PRE-CROPPING Available %	PRE-CROPPING Total %	POST HARVEST SAMPLES Lime series Available %	POST HARVEST SAMPLES Lime series Total %	POST HARVEST SAMPLES No lime series Available %	POST HARVEST SAMPLES No lime series Total %
(1) Nitrogen		0·167		0·167		0·180
(2) Phosphoric acid	0·013	0·190	0·019	0·191	0·011	0 210
(3) Lime (Cao)	..	0·114	..	0:196	..	0·173
(4) pH	5·52		5·10		5·18	
(5) Organic carbon		1·77		1·95		1·85

Increase in fertility status after harvest of potatoes.

	Percent
Nitrogen	0·013
Phosphoric acid (available)	0·0064
,, total	0·020
Lime	0·082
Organic carbon	0·18

R. E. Bullock Pump

by

R. G. MENON,

Research Engineer, Agricultural Research Institute, Coimbatore

Centrifugal pumps driven by oil engines and electric motors are undoubtedly about the most efficient means available for lifting water for irrigation and are fast becoming indispensable items in the equipments of most farms. Nevertheless these still remain out of the reach of several thousands of small farmers owning or cultivating only a few acres because their cost in terms of the financial resources of such farmers continues to be prohibitive. Irrespective of whether a farmer employs lift irrigation or not he has to necessarily maintain a few bullocks to do his ploughing and carting. It is seldom if ever that work can be found on a farm for these animals all the year round. Hence if a cheap and fairly efficient water lift which could be operated by a pair of bullock could be devised it was felt that many small farmers would consider its welcome addition to their equipment. It was with the object of providing such a water lift that the design of the bullock pump was undertaken in June '53 at the instance of the Director of Agricultural, Madras. The first successful model of the bullock pump suitable for use in open wells was manufactured and tested successfully at the Central Farm, Agricultural College, Coimbatore towards the end of 1953. In early 1954, a second model of the pump suitable for use in a tube well was also manufactured and tested.

The open well model of the bullock pump consists of two six inch pipes let down vertically into the well and clamped side by side, about 3 ft. apart to a wooden beam placed across the mouth of the well at ground level. The bottom ends of the two pipes extend a few feet below water level, and the top ends project 6′ above ground level. The lengths of these two pipes which form the pump barrels will therefore depend on the depth of water level below ground level. A delivery spout consists of a 3″ dia. pipe welded on to each of the barrels 2′ below the top. A flap valve opening upwards manufactured out of a standard 6″ coupling is fitted at the bottom of each of the two barrels. Two C. I. cylindrical plungers $5\frac{7}{8}$″ in dia., 12″ long with a central bore of $2\frac{1}{8}$″ dia., and each weighing 50 to 60 lb., work inside these pump barrels. The top of the central bore in each plunger is closed with a flap valve opening upwards. A standard leather pump bucket is fitted to the bottom of each

plunger for providing necessary sealing between the plunger and the barrel. The plungers have a stroke of 9′ extending from the water level upwards. The plungers are operated by means of two 3/8″ wire ropes. One end of each of these ropes is attached to a plunger. The ropes are then brought up through the pump barrels and over two pulleys carried on two brackets fixed to the tops of the two barrels.

The wire ropes then diverge horizentally to pass through two pulleys mounted on two posts situated diametrically opposite each other on the edge of a bullock track. The height of the pulleys on the post are so adjusted that the wire ropes are horizontal. After passing through these pulleys the 2 wires are brought together to a common terminal through a swivelling block on a rotating beam at a distance of 4½′ from the centre of rotation.

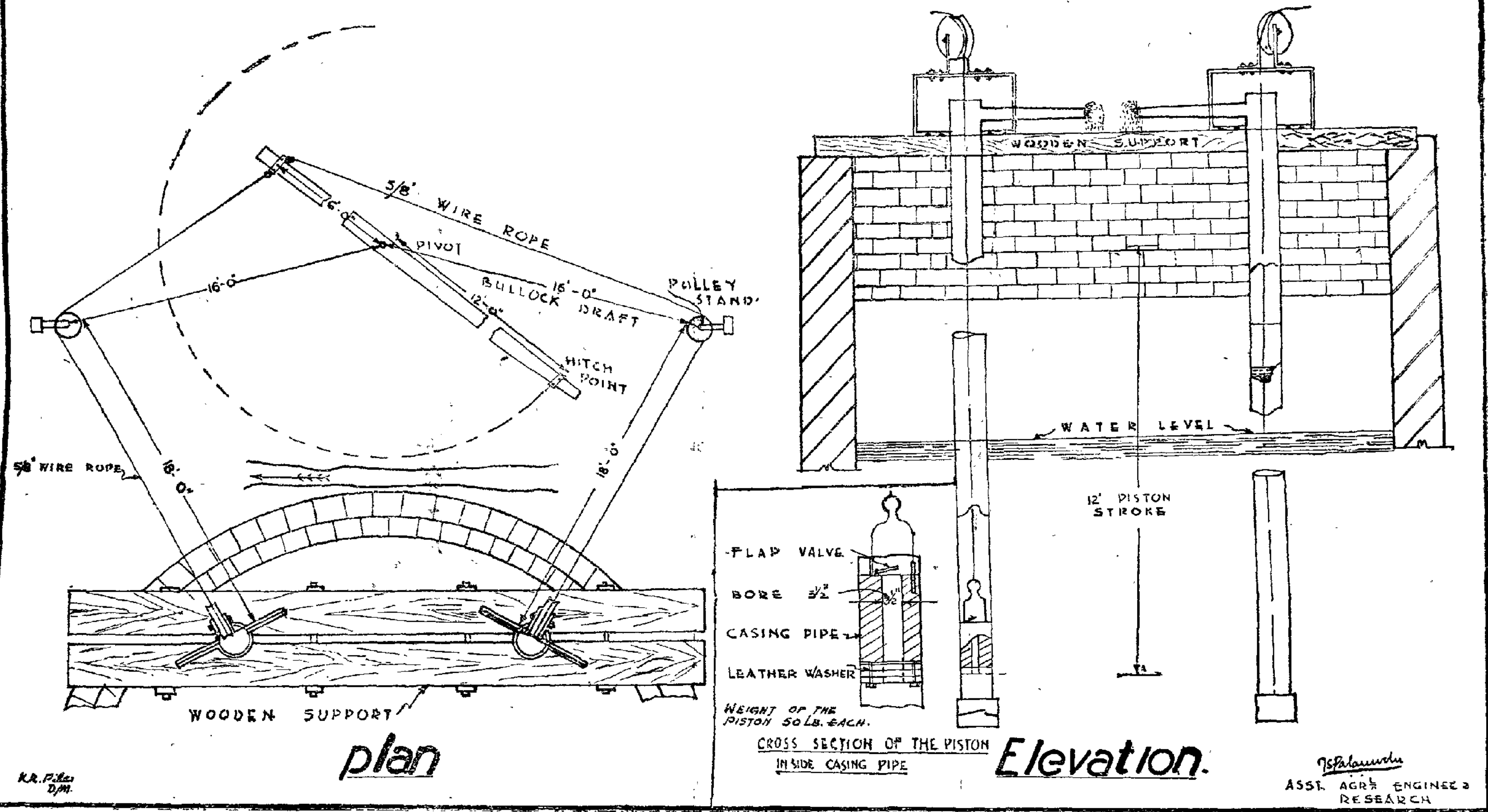
The rotating beam is mounted on a central pivot post fixed rigidly to the ground in a concrete foundation at the centre of the bullock track. A pair of bullocks is hitched to the free end of the rotating beam at a distance of about 12′ from the centre of rotation.

When the bullocks go round the track, the central beam rotates and the plungers move up and down the barrels one plunger ascending and lifting the water while the other descends. Each barrel discharges once during each rotation of the beam. A pair of average bullocks can go round the track at 2½ to 3 times per minute without undue strain.

During the preliminary trials conducted with this pump at the Central Farm, Agricultural College, Coimbatore, an output of 2700 gallons per hour against a total head of 20′ was obtained. Under identical conditions the output of double bullock mhote is only, 2000 gallons per hour.

The tube well model of this pump is very similar to the open well model, the points of difference being continued to the pump barrels alone. Each barrel in this case consists of a standard 3″ tube well filter point installed below ground level at a depth where a coarse sand medium bearing sufficient water is available. The filter point is connected to a 3″ pipe which extends up to 9 ft. below ground level. At this level, a check valve manufactured from two standard 3″ couplings welded together is interposed. The pump barrels consisting of a 5″ pipe is screwed on to the top of the check

R. E. BULLOCK PUMP
open well model.



valve. The plungers in this case have a stroke of 12 feet extending from the bottom of the barrel upwards. To obtain this stroke the common terminal for the wire rope on the rotating beam is fixed 6 ft. from the centre of rotation. The two pump barrels are spaced about 10 feet apart.

A bullock pump of the tube well model has already been erected at the Agricultural Research Station, Aduthuri in Tanjore district and one of the open well model at the Central Farm, Agricultural College, Coimbatore. Another unit of the open well type is shortly to be erected at the Coconut Research Station, Pilicode in South Kanara district. Drawings and estimates for both the types are given below:

Estimate for the Manufacture of one R. E. Bullock Pump Open-Well model suitable for a total lift of 20'

S. No.	Particulars of Materials	Quantity	Rate-Unit	Amount
			Rs. A. P.	Rs. A. P.
1	6" W. I. Pipes ..	50'	5 0 0 per ft.	250 0 0
2	2" W. I. ,, ..	6'	1 2 0 ,,	6 12 0
3	2" W. I. Coupling ..	2 Nos.	1 0 0 each	2 0 0
4	6" W. I. Coupling ..	4 ,,	10 0 0 ,,	40 0 0
5	C. I. Plungers (Rough Casting) ..	2 ,,	26 0 0 ,,	52 0 0
6	2" × 2" M. S. Bar for Central Pivot ..	5'	1 8 0 per ft.	7 8 0
7	4" Pulley with sleeve ..	2 Nos.	7 0 0 each	14 0 0
8	8" Pulley with ball bearings ..	2 Nos.	15 0 0 ,,	30 0 0
9	1" × 1" M. S. Bar for pulley frame ..	20'	0 12 0 per ft.	15 0 0
10	2" × ½" M. S. Flats for swivelling block ..	2'	1 0 0 ,,	2 0 0
11	5/8" M. S. rod ..	12'	0 3 0 per ft.	2 4 0
12	3/8" Wire rope ..	80'	0 6 0 ,,	30 0 0
13	T. W. Beam for supporting pump barrels 16' × 8" × 4" ..	2 Nos.	15 0 0 each	30 0 0
14	Wooden posts 8' long ..	2 Nos.	5 0 0 each	10 0 0
15	T. W. Poles 18' long for rotating beam ..	1 No.	15 0 0 each	15 0 0
16	Bolts and nuts, leather for flap valves, concrete for foundation etc. ..			35 0 0
17	Labour charges ..			100 0 0
18	Contingencies ..			33 8 0
				675 0 0

Estimate for Manufacture of 1 R. E. Bullock Pump—Tube Well—Model Suitable for a Total Lift of 20′

S. No.	Particulars of Materials	Quantity	Rate Unit	Amount
			Rs. A. P.	Rs. A. P.
1	3″ Tube well filter points ..	2 Nos.	115 0 0 each	230 0 0
2	3″ W. I. Pipes ..	15′	2 8 0 per ft.	37 8 0
3	3″ W. I. Coupling ..	8 Nos.	1 12 0 each	14 0 0
4	5″ W. I. Pipes ..	28 Nos.	4 12 0 per ft.	133 0 0
5	3″ W. I. Bends ..	2 Nos.	12 0 0 each	24 0 0
6	C. I. Plungers (Rough costing) ..	2 Nos.	26 0 0 each	52 0 0
7	2″ × 2″ M. S. Bar for Central Pivot ..	5′	1 8 0 per ft.	7 8 0
8	4″ Pulley with sheave ..	2 Nos.	7 0 0 each	14 0 0
9	4″ Pulley with ball bearing ..	2 Nos.	15 0 0 each	30 0 0
10	1″ × 1″ M. S. Bar for pulley frame ..	20′	0 12 0 per ft.	15 0 0
11	2″ × ½ M. S. Flat for swivelling block ..	2′	1 0 0 per ft.	2 0 0
12	⅝″ M. S. Rod ..	12′	0 3 0 per ft.	2 4 0
13	⅜″ Wire rope ..	80′	0 6 0 per ft.	30 0 0
14	Wooden posts 8′ long ..	2 Nos.	5 0 0 each	10 0 0
15	T. W. Poles 13′ long for rotating beam ..	1 No.	15 0 0 each	15 0 0
16	Bolts and nuts, leather for flap valves, concrete for foundation			35 0 0
17	Labour charges ..			10 0 0
18	Contingencies ..			23 12 0
				775 0 0

ON LORD RUTHERFORD

"He broke the indivisible
Made plain the invisible
Changed the immutable
And unscrewed the inscrutable"

(Stephen Miall)

Studies on the Influence of the time of Planting and Mulching on the Yield of Potato

by

K. SAPTHARISHI & M. D. AZARIAH

Agriculturai Research Station, Nanjanad

Introduction: There are three well-defined seasons for the potato crop on the Nilgiris, of which the main and the second crops occupy nearly 18,500 acres out of the average of 20,000 acres of the total area. The main crop, which is extensively cultivated, is planted in March-April and harvested in August-September. The second crop is raised between August and December. Both these crops are purely rain-fed and cover about 11,500 and 7,000 acres respectively.

The average annual rainfall is about 55 inches, half of which is received during the South-west monsoon rains, which is the period for the growth and maturity of the main crop. The remaining rainfall is received as equal halves, in the North-east monsoon when the second crop is on the field, and as summer rains which are usually accompanied by hail. Both the high winds and the hail-storms are harmful to the two crops, as they damage the haulms of the potato with consequent reduction of yields. Thus, the correct time of planting both the crops assumes great significance, if optimum yields are to be secured against the above adverse factors of seasons and rainfall. In addition, the second crop has to contend against the heavy ground-frost which usually sets in during the middle of December and continues up to the end of February. It is not uncommon if frost appears early in November and continues, in some years, till the end of March or even into April. In such extreme cases, the succulent potato haulms are cut down with heavy loss of yiels.

Trials were undertaken at the Agricultural Research Station, Nanjanad, during the three years 1949. 1950 and 1951, to fix the best time of planting the main and the second crops to secure optimum yields, and the results obained are presented in Section I of this paper. The crop is mainly grown over steep slopes. Hence during particularly heavy downpours, much of the valuable top-soil, with a good quantity of the fertilisers applied, is washed down. It is because of this that the ryots are forced to liberally manure the crop every year, the expenses on this account alone amounting to over Rs. 300/- per acre. The beating effects of the rains do not end with the losses of soil and fertility, but the developing top-tubers are also liable to be exposed to attacks by the tuber moth. Under such conditions, the

damage to the exposed tubers by pests like rabbits, rats, porcupines and wild bears may also prove severe. Due to such exposure the tubers tend to get hard and green before full maturity, resulting in a fall of their market value.

As a consequence of the rich manures applied, the common weeds in the region like spurry, oxalis, and polygonum also grow rank and use up the bulk of the plant food given for the crop. Labour is generally scare and the incessant rains miliatate against timely weeding of the land. Therefore, any step that would prevent the soil wash and, at the same time, keep the weeds in check, would prove a valuable aid to the farmer in considerably reducing his costs of cultivation and possibly increase his yields. To meet this object, trials were started att he Agricultural Research Station, Nanjanad, to study the effects of mulching the potato crop with dried vegetable refuse like the straw of *Samai (Panicum miliare)*, the cereal which is usually grown in rotation with potato. The results of such a mulching practice, which proved distinctly benefical, are recorded in Section II of this paper.

I. TIME OF PLANTING

Innes and Mac Dermott (1), investigating the loss due to late planting with the variety, *Majestic*, confirmed that delayed planting seriously reduced yields. Harvey (2) indicated that varietal characters had an important bearing on the time of planting, though the variety, *Arran Banner*, did not suffer the loss to the same extent as the variety, *Majestic*. Thomas and Eyre (3) recorded that the condition of the land and locality influenced the time of planting of early potatoes.

The popular early variety of potato, *Great Scot*, was used for the above trials. Four instalments of planting, spaced at fortnightly intervals, were adopted for the two crops af follows:

	Treatment	*Main crop*	*Second crop*
A	(Standard)	Planted on 15th of March	Planted on 1st of March
B	,,	,, 31st ,,	,, 15th ,,
C	,,	,, 15th of April	,, 1st of Sept.
D	,,	,, 30th ,,	,, 15th ,,

Each treatment was replicated six times. The cultivation and manuring followed were in conformity with the routine practices adopted at the Station. The earliest planted treatment (A) was taken as the standard for assay of yield data.

The summary of results of the trials, seperately for the main and the second crops, is presented in tables I and II.

TABLE I. Summary of resnlts — (Main crop)

	Treatments				General Mean	Standard Error
	A (Std)	B	C	D		
(1949)						
Acre yield in lb.	11528	10904	11540	10652	11156	1136
Percentage on standard	100·0	94·5	100·1	92·3	96·7	4·9
(1950)						
Acre yield in lb.	9880	10120	13160	10480	10910	894
Percentage on standard	100·0	102·4	133·2	106·1	110·4	9·1
(1951)						
Acre yield in lb.	16440	16260	22120	17090	17983	480
Percentage on standard	100·0	99·0	134·5	103·9	109·3	2·9

Conclusions: (1949): No significant differences; (1950): C, D, B, A;
(1951): C, D, A. B.

TABLE II. Summary of results — (Second crop)

	Treatments				General Mean	Standard Error
	A (Std)	B	C	D		
(1949)						
Acre yield in lb.	4316	2892	2268	1736	2803	752
Percentage on standard	100·0	67·1	52·5	40·2	64·9	8·7
(1950)						
Acre yield in lb.	4600	3960	2960	3840	3840	346
Percentage on standard	100·0	86·1	64·3	83·5	83·5	7·5
(1951)						
Acre yield in lb.	11840	7280	7520	6240	8220	564
Percentage on standard	100·0	61·5	63·5	52·7	69·4	4·8

Conclusion: (1949): A, B, C, D; (1950: A, B, D, C; (1951): A, C, B, D.

Discussion of Results: The results of all the three years, for both the crops, followed a like pattern. Taking the main crop into consideration, the treatment planted in the middle of April (C) had consistently returned the highest yields for each of the three years of trial. Further, the yield from this treatment was significantly higher than those of the other three for the two years 1950 and 1951. In the case of the second crop, a similar behaviour in favour of highest yields was evident and consistent for the treatment planted at the beginning of August (A), this treatment being significant over the rest in 1951.

II. MULCHING

Information on the subject of mulching the potato crop is limited. It has been recorded by Terman, Libby and Jenkins (6) that a light mulching of the land, after the potatoes are planted, helps to maintain the organic matter added thereby to the soil, making it better. The mulching materials used were partly retted straw, unchopped green grass and clover, and these were applied after the potatoes had been ridged once. Such a practice was observed to increase the yield considerably, while mulching with sawdust tended to lower yield values. Application of an extra dose of nitrogen, at the rate of 60 lb. per acre, further increased the yield of potatoes mulched with grass, but not those mulched with clover. Studying the effect of application of sawdust on the production of fall potatoes for improvement of the texture and water retention of soils, Johnson (4) found that the treatment tended to depress the soil nitrates due to their increased assimilation by bacteria using the sawdust as a source of energy, and concluded that the supply of nitrogen should therefore be increased if sawdust is applied. The use of trash and vegetable debris left on the soil surface, where they can act as a hindrance to evaporation has been mentioned by Keen (5) in the booklet, "Food and the People", published by the Bureau of Current Affairs, London.

The trials under report were conducted over three different crop seasons, viz., the second potato crops of the years 1950 and 1951, and the irrigated crop of 1951. Uniformly graded whole seed tubers of the popular variety, *Great Scot*, were used for the investigations. Cattle threshed dry *Samai* straw and chopped and dried stems of *Juncus glaucus* formed the mulching material. The experimental plots were laid out in randomised blocks, replicated six times. Five treatments were adopted as given below :

A	Control (Unmulched)				
B	Mulched at	1,250 lb.	of vegetable debris per acre.		
C	,,	5,000 lb.	,,	,,	,,
D	,,	8,000 lb.	,,	,,	,,
E	,,	10,000 lb.	,,	,,	,,

The mulch material was carefully weighed to conform to the above dosages, and spread out evenly over the related treatments, after planting the potato seed. The yield data for the three seasons, with statistical examination of the results, are summarised in table III.

Section II: MULCHING

TABLE. Summary of Results

Season and Crop	TREATMENTS (A)	(B)	(C)	(D)	(E)	General Mean	Standard Error	Mulch Material	Remarks
Second Crop (1950)									
Acre yield in lb. ..	5,655	4,150	5,100	5,525	5,525	5,245	376	Dry *Samai* straw	Crop cut down by early frost
Percentage on Control (A) ..	100·0	73·7	90·6	103·5	98·2	93·2	3·34	—	—
Second Crop (1951)									
Acre yield in lb. ..	3,400	3,900	5,500	7,850	8,200	5,770	980	Dry stems of *Juncus glaucus*	—
Percentage on Control (A) ..	100·0	100·0	161·7	230 8	241·1	169·6	28·8	—	—
Irrigated Crop (1951)									
Acre yield in lb. ..	4,700	4,900	4,400	6,150	7,200	5,410	82	Dry *Samai* straw	—
Percentage on Control (A) ..	100·0	104·3	93·6	130·8	153·2	116·4	1·7	—	—

Conclusion: Second crop (1950): D, A, E, C, B; Second crop (1951): E, D, C, B, A; Irrigated crop (1951): E, D, B, A, C.

Discussion of Results: Out of the three crops taken up for the trials, the second crop of 1950 could not grow up tó normal maturity, since it was subject to premature damage due to early frost. The other two crops completed their growth and came to lifting under normal seasonal conditions.

As examination of the yield data leads to the conclusion that mulching is conducive to higher potato yields. For instance, in the second crop (1951), the treatments that received mulch at 8,000 and 10,000 lb. per acre, significantly out-yielded the other three treatments including the control while, in the irrigated crop (1951), there were significant yield differences between each and every one of the treatments, the order of superiority being as follows: 10,000 lb., 8,000 lb. and 1,250 lb. of mulch, control and 5,000 lb. of mulch. For the second crop (1950), all the four treatments including the control were significant over the treatment with 1,250 lb. of mulch (B) but, as already stated, the crop was laid low due to severe ground frost before maturity, thus vitiating the yield values. Leaving this crop out of account, the results of the other two have yielded indications in favour of dressing the soil heavily with 8,000 to 10,000 lb. of mulch.

Another point that was evident was that mulching resulted in considerably cutting down the cultivation expenses by saving a course of weeding. Field observations showed that while the weed growth and population were very little or negligible in the mulched treatments, the control plots had to be given a hand-weeding, Normally, a round of weeding takes 50 to 60 women in these parts since, with weeding, the crop has to be carefully, earthed up. Disturbing the soil immediately beneath the plant may, again, tend to injure the stolons that would later develop tubers.

Samai is the main cereal grown in the tract. Since grazing is available in plenty, the cultivators are not very keen on storing the straw for cattle feed, The high cost of transport in the hilly tract is another factor. Hence, the normal practice is to burn the cattle-threshed straw, along with the stubbles left on the field, just before the land is opend for the following potato crop. Thus, this material is available for mulching the potato in abnndance. Even in the absence of this material, any dried vegetable debris may be used.

The benefits of mulching are manifold. The plant residue added to the soils, which are porous and deficient in humus, builds up the organic food reserve of the land thereby enriching it. Its effect on the check of weeds has already been mentioned. Mulching

helps the retention of moisture during the dry whether period (January — April), when the irrigated potatoes are on the field, leading to a reduction in the frequency of watering. During the heavy monsoon periods over which the main and the second potato crops are raised, the mulch protects the top-soil from the beating effects of the downpour, preventing wash-down of the soil and the manure from the land. When showers are so heavy as to lead to sheet or rill erosion, mulching will protect the exposure of the developing tubers nearer the soil surface to the elements and pests. The trials reported are being modified, in view of the results already obtained, to include quantitative studies on the relative moisture-holding capacities of the different treatments, weed population and degrees of severity of incidence of pests like the cut worm and the tuber moth.

Summary and Conclusion: From a review of the yield figures obtained, it is concluded that, to secure optimum yields under Nilgiri conditions, the main and the second crops of potato are best planted respectively by the middle of April and early in August.

Preliminary trials on the results of mulching the land under the potato crop with vegetable debris, at the Agricultural Research Station, Nanjanad, have indicated that such a practice is beneficial for increasing the yield of the crop; besides it acts as an effective check on weed growth and against soil erosion. Further studies on its value in conserving soil moisture and other points are in progress.

Acknowledgment: The authors recorded their gratefulness to P. Uthaman, K. Hanumantha Rao and P. N. Nayar, who were the Superintendents of the Station during the period, for their valuable guidance, direction and help in the conduct of the trials.

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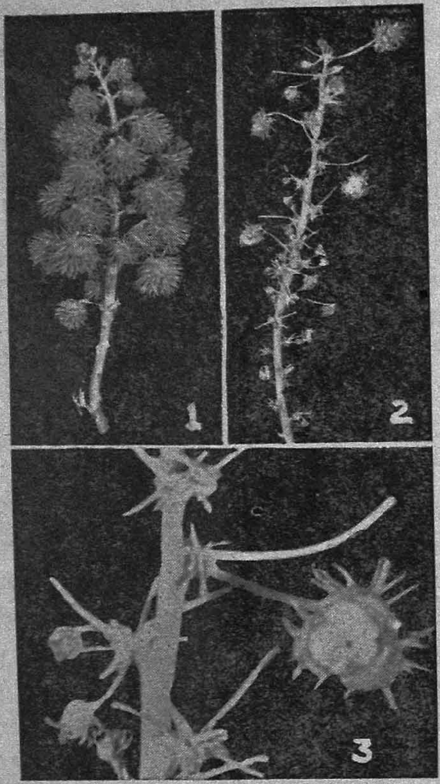
A Note on an Abnormality in the Fruits of Castor
(*Ricinus communis*, L)

The species *Ricinus communis*, L. is characterised by the ovary being three carpelled and each carpel containing a single ovule. The fruit is a schizocarp of three cocci and each coccus has a single seed. The capsule is partially dehiscent. In one of the cultures, i. e. R. C. 1080, a number of plants with one to two ovules in a single carpel was noted, during 1953 – '54 rainfed season at the Agricultural Research Station, Tindivanam. Observation on this abnormal type of castor is recorded here. As far as the authors are aware, no record of such occurence has been made so far. In one of the lines of the 12th generation progenies of a cross between R. C. 961 (Namakkal – irrigated) and R. C. 816 (Kumbakonum) grown under rainfed conditions, a number of plants with poor fruit-set was noted. On closer examination these were found to have abnormal capsules with more than one ovule in one coccus. It was noted that these plants showed heavy shedding of the female flowers and only a few that remained developed into fruits. These abnormal fruits as they develop showed slight splitting of the carpellary wall towards the top exposing the developing seeds in the cocci in which there is more than one seed. Generally only one of the cocci show the double seeded condition and rarely two cocci have two seeds in each making up a total of four or five seeds in the schizocarp instead of the normal three noted in the species. The two seeds occurring in a single carpel are placed one over the other. Development of size is poor in them but the seeds are properly formed and are viable. The placentation of the ovules is, however, axillary and therefore normal. Due to the increase in number of ovules in one of the carpels the splitting of the pericarp takes place quite early in the development of the fruit. The occurrence of two ovuled carpels has been calculated to be about 2% of the population in the 12th generation of the cross. The tribe *Crotoneae* under which *Ricinus communis* is placed is characterised



by the single ovuled condition in each carpel. Under *Euphorbiaceae* the genera coming under the tribes *Buxeae* and *Phyllanthae* only have two ovules in each cell. The occurrence of two ovuled carpels in *Ricinus communis* shows the possibility of a genetical aberration. The type is under further study.

Acknowledgements are due to Sri D. Daniel Sundararaj, Lecturer in Botany, Coimbatore for his help in preparing the note.

Agricultural Research Station, Tindivanam.

BHAVANI SHANKER RAO, M.
THANDAVARAYAN, K.

A Note on Crabs (Paratelphusa hydrodromus. H) in Paddy Fields — Control with Warfarin Baits

During the course of poison baiting trials with 'Warfarin' at 0·025% in popped rice with fried onion and fish bits as attractants against field rats, it was found that crabs (*Paratelphusa hydrodromus.* H) in the experimental area of four acres under 'Samba' crop, were freely feeding on the Warfarin baits and a total of 113 dead crabs were collected. Apart from this, some more might have died within the burrows and a few other dead ones might have been carried away by brids etc. This heavy casuality of crabs noticed in the experimental area suggested the possibility of using 'Warfarin' baits for the destruction of the crabs in the paddy fields.

Trials were accordingly carried out to test the efficacy of the poison bait when fed to crabs of similar size and appearances for different periods ranging from 1 to 4 days and changing to normal food thereafter. The survival of the crabs in the different sets was compared with the control set of crabs of similar size and number with unpoisoned food. The condition of the crabs in the different treatments was also noted. The results of the various treatments are given in table below:

Statement showing the duration of survival of crabs with poisoned baits

TREATMENTS	Duration of survival of crabs		
	I set commenced on 28—1—1953	II set commenced on 16—1—1953	III set commenced on 2—2—1953
Popped rice and fried onions and fish bits with 0·025% Warfarin for 1 day	7 days	8 days	9 days
,, ,, for 2 days	5 ,,	6 ,,	7 ,,
,, ,, for 3 days	2 ,,	4 ,,	5 ,,
,, ,, for 4 days	2 ,,	2 ,,	4 ,,

With control sets of crabs fed with unpoisoned food viz., popped rice, fried onions and fish bits and with natural food viz., young paddy plant and bits of fish, no casualities were noticed and they were found healthy. The data reveal that the shortest period of morality is in the case of crabs fed with poison baits continuously for four days and changed over to normal diet thereafter. This period of survival varies from 2 to 4 days for crabs fed with poison baits for 4 days continuously and 7 to 9 days for crabs fed with poison baits for a day only. No distinct advantage was noticed when the base in the poison bait was changed from popped rice to fried or raw rice bran as advocated by Venkataraman (1929).

Field trials with 'Warfarin' baits at Agricultural Research Station, Aduthurai, from September '52 to February '53 in paddy areas have been found very effective in controlling the crab menace. The use of 'Warfarin' baits for control of field crabs deserves to be popularised in areas where trouble due to crabs are encountered. The baits can be conveniently kept in coconut shell at places frequented by crabs. The baiting should be continued for atleast a week in the field with the addition of 2% Nitrophenol to prevent the development of moulds in the baits. In the experiments conducted Dethmor containing 0·5% 'Warfarin' available with Messrs. Standard Chemical and Pharmaceutical Company, Bombay, was used The cost of baiting with 'Warfarin' works out as Rs. 8/- per acre. With increase in the demand for 'Warfarin', its price is likely to go down appreciably. Dropping into crab holes a pellet of the poisoned food of the size of a pigeons' egg can also be undertaken if crab holes are not too many as this seems to be the best method of baiting according to Rao and Susaynathan (1923).

Agricultural College & Research Institute, Coimbatore.

TIRUMALA RAO, V.
SANTHANARAMAN, T.

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A Preliminary study on the distinctiveness of Dormancy and Viability in vegetable seeds

In the interests of the survival of the species, delay in germination or dormancy of seed is of great value to the plant. Dormancy, as defined by William Crocker, a pioneer worker in seed research, is a '*general term*' which may be applied to any condition which prevents

germination, when ordinary requirements of moisture and temperature have been met. Barton Lela, as cited by William Crocker, finds that under natural conditions in the soil while some of the seeds of *Amaranthus reoflexus* (a weed) germinate in less than ten months, others remain viable without germinating, even though they would have absorbed water. It is to be noted that when a seed germinates in a soil after such a long period as ten months it cannot be due to obtaining of a particular condition of temperature; for the soil temperature varies, while the requirements may already be there. So, if the above definition of dormancy is correct and the time taken must essentially be due to the process of softening of the outer coats of the seed. Attempts to scarify or soften the seed coats by different treatments to fecilitate successful germination are often called as 'breaking up dormancy'. But it may not be correct to say so if it is understood, that dormancy and viability go hand in hand while dormancy is the means and viability is the end. Dormancy covers a period of conception when the germ-plasm of the seed developes to become viable and until then it is incapable of germinating, in this light, it is reasonable to accept the finding of Thornton Norwood that lettuse seeds were dormant when freshly harvested and after ripen in dry storage. So dormancy should not be considered as a '*general term*' for a scientific study; for it refers specifically to the latency of life in the seed before it could germinate. Some ordinary observations should be able to bring out this distinctiveness and this report embodies the result of such an attempt.

Seeds of tomato, amaranthus, cowpea, bitter gourd, okra and snake gourd were selected to represent types of seeds for the study. Seeds of the first three kinds were tested on germination trays on moist filter paper and the rest on the medium of moist sand. Germination counts were taken on the emergence of the hypocotyl in the case of filter paper medium and on the appearance of green shoot at surface in the other case. Seeds for the tests were extracted from fully ripe fruits on 30—10—1950 and dried in the sun for 3 days before commencing the tests. The actual tests started on 3—11—1950 in duplicate. The counts were taken from the next day and continued for ten days. The test was repeated at fortnightly intervals till 18—4—1951. With the exception of bitter gourd all other seeds do not show any dormancy at the beginning as they start with full germination capacity even on the first week. Upto the second fortnight, there is only rise and no fall in germination percentage. In the subsequent two fortnights, however, there appears to be a slight decline in germination capacity. From the sixth fortnight onwards the germination percentage tends again to increase.

To investigate whether frequent dryings affect the dormancy of these seeds, representative samples of each seed were made up into duplicate sets. One such sample was dried for one day before every

germination test, while the other was stored away after the initial drying alone. It became clear from germination counts taken systematically that frequent dryings have no effect on retarding the dormancy of these seeds.

From the tests it became clear that so far as some vegetable seeds are concerned, it seems as though there is no dormant period for them at the beginning during the first week after their extraction. This is almost viviparous tendency. Following this the rapid ascent of the percentage in the second week itself becomes a complement; that there is decline thereafter is an indication that the seeds enter a dormant life and that the percentage of germination does not improve even after 3 months is a casual indication that only certain seeds set out of the latency of life in that period and the rest remain dormant for a further period with due regard to the finding of Barton Lela.

Thus the vegetable seeds in the test, in spite of the varying nature of their seed coats, do not show dormancy soon after harvest. There was a decline in the germination percentage during the second month, but it was not the result of loss of viability, as the figures again improve after the period.

Paddy Breeding Section,
Agric. Research Institute,
Coimbatore.

SHANMUGAM, T. S.

"Twenty years of Seed Research" — William Crocker; "Dormancy in Wheat and Barley varieties in relation to breeding" — J. B. Harrington and P. F. Knowles - 5 Agri. Vol. 20, 1939 - '40.

The Atoms in turn, we now clearly discèrn
Fly to bits with the utmost facility
They wend their way
And in splitting, display
An absolute lack of stability.

(Stephen Miall).

CORRESPONDENCE

From

A. P. KRISHNASWAMI NAIDU,
Avarampalayam, Ganapathi Post,
Coimbatore, 16—6—1954.

Sir,

In sowing, the country drill, Gorru, leaves the seed at an ill-fitting spot $1\frac{1}{2}$ to $2\frac{1}{2}$ inches below the surface. The proper seed depth advised seems to be half an inch. This in practice is hard to achieve with the Gorru as it is now. The angle between the tyne and the shaft being 45 degrees the furrow is made a little too deep, up to $2\frac{1}{2}$ inches. A shallower furrow is impracticable with this plough. In this connection I like to suggest a slight change in the angle of the tyne and the pole by fitting it at 30 or 36 degrees; and request the Research Engineer for advice in this matter, and to make a trial of the suggestion if feasible.

As an alternative to the above change, I think that the shaft can be so adjusted to the beam of the plough that the angle of draught can be varied at will by some simple mechanism.

Yours cordially,
A. P. KRISHNASWAMI.

* * * *

Office of the Asst. Agrl. Engineer (Research),
Lawley Road P. O., dated 26—6—1954.

Sir,

I acknowledge receipt of your letter dated 16—6—1954. The Millet Specialist and the Cotton Specialist were consulted regarding the advisability of sowing seeds at as shallow a depth as $\frac{1}{2}$ an inch.

The Millet Specialist is of opinion that the optimum depth for sowing millet seeds is about 2″. Seeds sown at a shallow depth develop a very shallow root system which increases the tendency of the plant to lodge. If seeds are sown at a depth of $\frac{1}{2}$ an inch the moisture available may not be sufficient for the seeds to germinate unless a few light showers are received, after the sowing. Further in case very heavy showers are received the seeds are liable to be exposed and carried away by ants and birds A shallow root system also limits the area from which the plant is able to absorb nutrients.

In case of cotton, drill sowing is usually adopted, only where the crop is raised on the rainfed conditions. Sown at a depth of $\frac{1}{2}$ an inch enough moisture may not be available for the germination of seeds unless light showers are received after the sowing, Hence the depth of sowing recommended in the case of cotton is 1″.

A fairly wide range of depth of sowing can be obtained in a country gorru by hitching the bullock either nearer to or farther away from the implement and also by attaching the shaft pole either below or above the yoke. In case of wider range desired it is possible purely from an engineering point of view to alter the angle between the shaft pole and the tynes from 45 to 30°.

Asst. Agrl. Engineer (Res.)

Note on Rayungan in Sugarcane Cultivation: Rayungan is sprouted bud on Sugarcane and it is considered fit for planting when about 6 – 8 weeks old. Younger Rayungans are inferior, to stout and aged ones in the matter of establishment in the field. However experience showed that Rayungans are in no way better than setts. In the trials conducted on Sugarcane Research Station, Gudiattam, from 1951 — '52 to this date, it has been observed that setts sprout and come up better than the Rayungans from the very beginning of the growth. The percentage of establishment of Rayungans depends on the age, size and the after care taken for establishment of the same. In Rayungans more than 90% establishment is considered satisfactory, but this is found to be difficult of achievement of local conditions.

From the date of planting Rayungans need a fairly moist condition of the soil for better establishment failing which the establishment is very low. The only advantage in Rayungans is, it affords quick multiplication and hence when this is combined with short cropping in factory areas, when new varieties are required to be multiplied and spread to a large extent, the method would be most suitable. Rayungans are obtainable in instalments as only the top buds yield good sized Rayungans after 6 weeks and the bottom ones takes some more time to develop to the required size. As such planting has to be done in instalments and not in one instalment as in the case of setts. It is generally believed that there is saving in cane by planting Rayungans as against setts, where as the observations do not confirm the same. The experiments conducted show that planting Rayungans or setts with 12" spacing in the furrows taken 5 links apart is the optimum and as per this spacing the seed rate works out to 13,000 to 14,000 Rayungans per acre. To obtain 13 – 14 thousand Rayungans it may be necessary to cut canes with atleast 18,000 buds to allow for rejections, as is very common in Rayungans. Only best and well grown Rayungans are taken and the rest rejected and hence the need for the above number to be cut. The topped canes may be planted as either Tjeblokam or crushed. But they are poor in quality and they cannot give good quality jaggery, nor can they be supplied to factory as millable cane. (Tjeblokans are the top halving). Of the canes cut for producing Rayungans and these when planted strike roots and give Rayungans otherwise known as Tjeblokans. In view of their lack of root system at planting they take longer time than topped canes to give required size Rayungans.

As regards population of cane it is generally better in Rayungan than in setts this would be evident from the data of the year 1953 — '54 given below:

Population per acre

Spacing with row	Co. 419 setts (3 buded)	Co. 419 Rayungans	Co. 449 setts (3 buded)	Co. 449 Rayungans
6"	38,520	39,780	40,830	36,080
12"	35,260	31,030	35,260	33,340
18"	26,970	31,260	27,640	32,900

The yield data of 1953 — '54 trial is as follows :

Spacing	Co. 419 setts (Tons/Acre)	Rayungan (Tons/Acre)	Co. 449 setts (Tons/Acre)	Rayungan (Tons/Acre)
6″	47·66	45·54	42·99	42·40
12″	52·93	48·97	44·68	45·71
18″	38 90	47·23	34 02	46 92

The Rayungans have yielded better than setts only in plots planted with 18″ spacing and in other treatments the difference in yield is not marked. However to arrive at definite, conclusions replicated randomised trial has been laid in the current year

2. **"Oil Content and Economic Value of Eucalyptus species".** The history of Eucalyptus on the Nilgiris dates back to the year 1845, when it was first introduced by the early settlers mainly as an experimental measure in their hunt for some trees which will yield them abundant supply of fuel. Encouraged by the intital success of this venture, large-scale planting of Eucalyptus, mainly the species *Eucalyptus globutus,* commonly called 'Blue-gum' commenced in the year 1850 and within a few decades large plantations of 'blue gum' flourished in these hills. It is now a common sight to find hill slopes in the various parts of Nilgiris clothed with blue gum plantations.

The genus Eucalyptus consists of more than 200 species, all being natives of Austrialia. Of these, only 35 species have been tried on these hills and specimens of these, most of them 50—60 years old, can be found even now at the Government Botanic Gardens, Ootacamund and Sim's Park, Coonoor. These vary in their economic importance, either as yielders of oils of medicinal or of perfumery value or useful for fuel or timber. Of the 35 species, *Eucalyptus globlus* alone has been exploited commercially to the full. The value of the other species as oil-yielders has not been gauged. This is chiefly because of the high medicinal value of the blue gum oil which is employed in the cure of malaria. The relative immunity of Australia from malaria is said to be due to its large Eucalyptus plantations. Hence the genus Eucalyptus deserves to be studied in greater detail of the various species, particularly from the point of view of their oil content.

Though it is well known that the oil of Eucalyptus is extracted from the 'blue gum' few people are aware that other species as well are capable of yielding oil of equal value. To study the oil content of the various other species, trial distillations were carried out at the Government Botanic Gardens, Ootacamund, for the last 2 years in a rather rough way. The results are tabulated below :

(1)	Eucalyptus	anygdalica	0·69	(15)	Eucalyptus	marginata	0·47
(2)	,,	botryoides	0 03	(16)	,,	melliodora	0·45
(3)	,,	citriodora	0·46	(17)	,,	pullularis	0·47
(4)	,,	crebra	0·22	(18)	,,	piperita	0·34
(5)	,,	deanii	0 42	(19)	,,	punctata	0 32
(6)	,,	dives	0·30	(20)	,,	regnanus	0·32
(7)	,,	eugenoides	0·25	(21)	,,	resinifera	0·25
(8)	,,	ficifolia	—	(22)	,,	redunica	0·45
(9)	,,	globulus	0·55	(23)	,,	robusta	0·02
(10)	,,	gemiphoia	0·21	(24)	,,	saligna	0·08
(11)	,,	longifolia	0·40	(25)	,,	smithii	0·30
(12)	,,	macrocornys	0·28	(26)	,,	teretocornys	0·63
(13)	,,	maculata	0·21	(27)	,,	viminalis	0·30
(14)	,,	macrandra	0·34				

The percentage of oil noted could be considered only rough indications of the value of the species at this elevation. The distillations were carried out in a 'still' which is likely to be only half as efficient as if done on a strict laboratory scale or under ideal conditions. The oil content, moreover, is governed by such other factors such as climate, season, soil conditions and different stages of the plant, age of leaves etc. Difference in the oil content between individual trees of the same species is also not uncommon. Thus for example, the percentage recorded for *Eucalyptus anygdalina* is 3%, though it was possible to get only 0·69% with the available apparatus and facilities. With improvement in the distillation 'still' and under ideal conditions, it should not be difficult to obtain higher recoveries of oil from the various species at this elevation.

Next to 'blue gum' which is most commonly used in the extruction of oil, *Eucalyptus citriodora* ranks second in importance with its highly cented oil. The oil contains a large percentage of 'citral' a base for perfumes, and because of this, oil of Citriodora is highly valued and is chiefly in demand from the perfumery industry, mainly for soaps. This species is therefore coming into prominence of late.

3. **Sugarcane Introduction of Promising now Varieties Co. 467 in the Pugalur Sugar Factory Zone:** In the Pugalur Sugar Factory Zone the variety Co. 419 is being grown practically over the entire area. Ratooning for two seasons is an established practice in all centres supplying canes to the factory. But this variety is very susceptible to smut disease. The necessity to find suitable alternate varieties became very urgent.

Co. 419 variety gives to the grower good tonnage. So any alternate variety acceptable to the growers should be definitely more promising than Co. 419. In the factory area encouragement will be given only to varieties that can give a higher recovery. The variety Co. 467 is therefore found most suitable for multiplication and further large scale trials under ryots conditions and has therefore been released for these purposes for the first time this season. The ryots are willing to grow this cane and the factory management also are agreeable to its release for trials.

The following are important features to justify the spreading of this variety for further large scale trials.

(1) The field of Millable cane is always more than in Co. 419 variety for all seasons of planting. (2) Its juice quality is not inferior to Co. 419. (3) It is a completely non-flowering type (4) It is fairly resistent to smut. (5) It tillers profusely and is eminently suited for ratooning. (6) Its juice quality does not deteriorate even by 12 to 13 months of age of crop and is therefore very ideal for late season crushing. (Director of Agriculture, Madras).

EXTRACTS AND GLEANINGS

The Genetics of Jassid Resistance in Cotton - I. The Genes H_1 and H_2 by R. L. Knight J. Genet. 50, 1952—47—66. (Ministry of Agriculture, Sudan Government, Mem. Res. Divsn. No. 27, 1952.)

Serious damage to Sakel variety of cotton *(Gossypium barbadense* L*)* by Jassids *(Empoasca libyca)* is caused in the Sudan Gezira, in irrigated tract between the Blue Nile and the White Nile. The present paper deals with the study of inheritance of leaf hairiness in cotton and the position of main hairiness genes H_1 and H_2 is discussed and in a subsequent paper it is proposed to be shown how a high degree of jassid resistance can be built up by adding to H_1 a limited number of minor genes. The final objective is the synthesis of jassid immunity in Domains Sakel. It is known that resistance to jassid *(E. facilis)* depends on the presence of hairs of adequate length and density on the underside of the leaves and observations showed that this relationship holds good for *E. libyca* also. Hence the study of the inheritance of leaf hairiness in cotton is of vital importance.

Jassid damage has been known much longer, and is much more widespread in Upland *(G. hirsutum)* than in Egyptian cottons. Jassid like blackarm, tends to be epidemic in some what drier tropics rather than in a wetter forest country. The Punjab, the Northern Sudan, the drier cotton growing areas of E. Africa are typical jassid epidemic localities. This distribution of jassids in the rather drier areas may be partly explained by Hanna's work in the Sudan Gezira, where it was proved that rainfall of sufficient intensity controls jassid by means of mud splash until the cotton plants grow too tall for mud splash to be effective. Thus countries with finely divided soils and a reasonably heavy and well distributed rainfall would not be expected to suffer from epidemic jassid attack.

The connection between hairiness and jassid resistance has been attempted by several workers. Parnell (1928) pointed out that both the length and density of the hairs are concerned in jassid resistance. This was confirmed later by Peat (1928) and others. Parnell (1945) pointed out that hairiness of stem is not essential for even a high degree of resistance and this also holds good for hairiness of petiole and this was confirmed later by Parnell, King and Ruston (1949). It was further pointed out that hairs on lamina and midrib have both influence on resistance but a high degree of midrib hariness is not essential if the lamina is hairy. In the Sudan, cottons with long and dense hairs remain free from hopper burn when the more glabrascent types are heavily damaged by severe infestation with *E. libyca.*

The inheritance of hairiness in New World cottons has been studied from time to time. Worrall (1923) reported a correlation between hairiness and short staple. Parnell (1927) also noted that the heavy yielding jassid resistant plants in a mixed crop tended to be short in staple, but he found that types with 'fairly long lint' combined with jassid resistance could also be selected. Simpson (1947) working with a Pilose Upland mutant found that pilosity and short lint were universally associated and are regarded as pleiotropic effects of a single gene. It was Harland (1929) who first pointed out that fuzz and lint are part of the general hairiness mechanism of the plant and that in selecting hairy cottons for jassid resistance it is probable that lint index and fuzz may be interfered with.

For genetical investigations a representative assortment of hairiest types within each of the two main species of New World cottons *G. barbadense* and *G. hirsutum* was chosen for investigation. *G. tomentosum* was added to the list because of its extreme density of hair population, though its hairs are of negligible length. The varieties investigated in *G. barbadense* are *Carpulla*—A perennial with

strong tomentum; *Tanguis*—a strain now pure breeding for hairiness and plant habit has been insolated by resection; *Sakel* two varieties viz., N. T. 2 and Domains Sakel. Both are susceptible to jassids by reason of their almost glabrous leaves. The varieties chosen in *G. hirsutum* are (1) M. U. 8b. This strain is resistant to both jassid and blackarm and selected in India from Malwa crop by Hutchinson (2) *Kapus Purao*—A jassid resistant American Upland cotton from the Philippines (3) *St. Ignatious* belongs to *G. hirsutum* var *marie galante*—collected from British Guiana. It has lamina hairs of excellent length and fair density. *G. Tomontosum* is a wild type from Hawaii which has a dense tomentum on the lamina surfaces (especially below), composed of hairs of negligible length.

Under Sudan conditions Sakel suffers a very severe jassid attack. *Tanguis* and *carpulla* both show marked resistance but not immunity, while M. U. 8b, Kapas Purao and St. Ignatius are effectively immune. The reaction to *G. tomontosum* is not known as it has never been grown in Sudan in a severe jassid season but it is unlikely to possess any worthwhile resistance.

Investigations on the genetics of the lamina hairiness of the cross Carpulla and Sakel showed that the hairiness of carpulla is controlled by a main partially dominant gene, H_1, accompanied by minor hairiness genes which increase hair density and to a certain extent hair length.

Crosses of Tanguis with Sakel showed that the full lamina hairiness of Tanguis is controlled by H_1 accompanied by a small number of minor genes. The genetical analysis of the crosses between M. U. 8b and Sakel revealed that intensifying genes, augmenting the effect H_1 play an important role in the production of long dense hairs characteristic of M. U. 8b. Minor hairiness genes (as distinct from intensifiers) were of little accounts. In the case of the crosses between St. Ignatius and Sakel, the genetical analysis regarding lamina hairiness showed that H gene from St. Ignatius and H_1 occupy the same locus and since the two genes are phenotypically similar they can probably be regarded as identical. The jassid resistance of St. Ignatius is thus basically due to H_1. Investigations on the lamina hairiness of *G. tomentosum,* with barbadense cross showed that the gene governing the tomentum of *G. tomentosum* occupies a separate locus from H_1 and has been given the symbol H_2 in preference to Harlands' H^{TO}. Studies of the cross of Kapas Purao with Sakel showed that the good length and density of the lamina hairs of Kapas Purao are controlled by a major gene fortified by intensifying genes, minor hairiness genes having an almost negligible effects.

The author is of opinion that jassid resistance is rare in *G. barbadense,* presumably because jassids are not a serious pest in the main areas where barbadense cottons are grown commercially. In the Sudan, jassid has only become severe in the recent years. The reasons for the failure to show resistance by Sudan Sakels have been discussed. It is unlikely that resistance can be built up solely by the action of minor genes in view of the fact that major hairiness gene has been found in each of the jassid resistant types investigated. Since hairy plants of Egyptian type cotton have, however, been noted by several workers in Egypt it is possible that Sakel would evolve jassid resistance types if large areas of the crop were exposed to epidemic attack for a suffieient number of generations. With regard to *G. hirsutum,* jassid resistance is negligible in the variations of U. S. cotton belt, from which the modern Uplands of India and Africa sprang. Strong resistance has been built up in India and in Africa, by selectien under impact of the disease.

The weak resistance evolved in some South Aferican forms of *G. barbadense* by the addition to H_1 of minor hairiness genes which have direct action on the production of hairs. By contrast, *G. hirsutum* acquired resistance by the addition

of intensifying genes, which lengthen the hairs produced by a basic H gene but which in the absence of H have little or no effect.

Summary: (1) Hairs of sufficient length and density on the underside of cotton leaves confer immunity to jassid.

(2) The resistance of Carpulla and Tanguis, two barbadense perennial types, is due to a basic, partially dominant hairiness gene designated H_1, accompanied by a number of minor, hairiness genes.

(3) H_1 is identical with the gene previously called H^D and H^{TAN} by Harland.

(4) Jassid resistance of M. U. 8b, a *G. hirsutum* commercial type from India, is controlled by H_1 accompanied by intensifying genes which augment the effect of H_1. H_1 also provides the genetic basis for the resistance found in St. Ignatius a variety of *G. hirsutum* var *marie galante* from British Guiana.

(5) Resistance of Kapas Purao was found to depend on a gene phenotypically similar to H_1 accompanied by hair length intensifiers.

(6) A hairy density gene H_2 (Harlands H^{TO}) is responsible for the dense tomentum of *G. hirsutum*. (N. K. I.)

CROP AND TRADE REPORTS

Crop Statistics, Madras State, 1953—'54. Cumbu (Bajra) Third or final forecast: The area sown is estimated at 1,402,000 acres. Compared with the final area in the previous year, this is a decrease of 3·6% and is higher than the average area during the five years ended 1952–'53 by 10·9%. Cumbu is not grown in the West Coast and the Nilgiris. An increase in area over that of the previous year is estimated in the districts of South Arcot, Salem, Coimbatore, Tanjore and Tirunelveli and a decrease in the other districts of the State. The main crop has been harvested. The yield per acre is estimated to be higher than that for last year in all the districts of the State. The seasonal factor for the State as a whole works out to 97% of the normal as against the final estimate of 67% for the previous year. On this basis the total yield works out to 347,700 tons of unhusked grain or 278,200 tons in terms of cleaned grain. Compared with the final estimate for the previous year, this represents an increase of 32·9% shows an increase of 46·8% as compared with the average yield for the years ending 1952-53.

Cholam (Jowar)—Third and final forecast: The area sown is estimated at 1,717,300 acres. Compared with the final estimate is a decrease of 5·2% and shows an increase of 1·7 over the average area for the five years ended 1952–'53. Cholam is not grown in the districts of South Kanara and the Nilgiris and it is an insignificant crop in Malabar and Tanjore districts. Compared with the final area of 1952–'53, the present estimate reveals an increase in the districts of Coimbatore, Tanjore, Madurai and Ramanathapuram and a decrease in the other districts of the State except Malabar where the area is expected to be the same as that of last year. The main crop has been harvested in most districts of the State. The yield per acre is expected to be higher than that for next year in all the districts of the State. The seasonl factor for the State as a whole works out to 97% for

Kharif crop and 94% for Rabi crop as against 72% and 71% respectively for the previous year. The total yield for the State works out to 5)7,500 tons of unhusked grain or 474,000 tons of cleaned grain. This represents an increase of 27·8% compared with that for the previous year and an increase of 31·6 over the average yield for the five years ended 1952–'53. The increase is mainly due to better seasonal conditions in the year under report.

Tenai — Third or Final Forecast: The area is estimated at 82,3 0 acres. Compared with the finally recorded area in the previous year, this is a decrease of 9·1%. The present estimate is lower than the average area during the five years ended 1952-53 by 2·3%. The crop is not grown in the South Kanara district. The area estimated is the same as that of the last year in the districts of Tiruchirapalli, Tanjore and the Nilgiris. A decrease in area is estimated in the districts of Chingleput, North Arcot, Salem and Coimbatore and an increase in the other districts of the State. The bulk of the crop has been harvested. The yield per acre for the State as a whole is estimated to be 29·7% higher than that obtained in the last year. The increase is due, in general, to favourable seasonal conditions this year. The seasonal factor for the State as a whole works out to 96% of the normal as against 74% in the previous year. On this basis, the total yield works out to 25,800 tons of unhusked grain or 20,600 tons of cleaned grain. Compared with the final estimate for the previous year, this represents an increase of 16·2% and reveals an increase of 27·1% as compared with the average production for the five years ended 1952–'53.

Varagu — Third or Final Forecost: The area sown is estimated at 623,200 acres. Compared with the final area for the previous year, this reveals an increase of 0·7% and shows a decrease of 2·0% compared with the average area for the five years ended 1952–'53. The crop is not grown in the South Kanara district. Compared with the previous year, an increase in area is estimated in the districts of Chingleput, South Arcot, North Arcot, Salem, Tanjore, Madurai, Tirunelveli and a decrease in the other districts of the State except Malabar where the area estimated is the same as that for last year. The bulk of the crop has been harvested. The yield per acre for the State as a whole is estimated to be 28·9% higher than that obtained during the previous year. The seasonal factor for the State as a whole works out to 98% of the normal as against 76% in the previous year. On this basis, the total yield works out to 269,300 tons of unhusked grain or 161,500 tons of cleaned grain. Compared with the final estimate for the previous year, the present estimate is an increase of 26·3% compared with the average yield for the five years ended 1952–'53. The increase is due, in general, to favourable seasonal conditions this year.

Samai — Third or final forecast: The area sown is estimated at 490,400 acres. Compared with the final area in the previous year, this is a decrease of 6·0% but shows an increase of 22·1% over the average area for the five years ended 1952–'53. The crop is grown mainly in the districts of Nort Arcot, Salem, Coimbatore, Tiruchirapalli, Madurai, Ramanathapuram and Tirunelveli. A fall in area is estimated in the districts of Chingleput, South Arcot, Salem, Madurai and Ramanathapnram. The area estimated in South Kanara District is the same as that of last year. An increase in the area is estimated in the remaining districts except Tanjore where the area under the crop is negligible. The crop has been harvested in most districts of the State. Yield per acre for the State is estimated to be 32·4% higher than that obtained last year. The seasonal factor for the State as a whole works out to 98% of the normal as against 74% in the previous year. On this basis, the yields for the State as a whole works out to 94,600 tons of unhusked grain or 52,000 tons in terms of cleaned grain. Compared with the yield in the

previous year, the present estimate shows an increase of 24·5% and is higher than the average for the five years ended 1952–'53 by 59·0%.

Cotton — Fifth and Final Forecast: The area sown is estimated at 848,500 acres. Compared with the finally recorded area for the previous year and an average area calculated for the five years ending with 1952 — '53, this is an increase of 16·6% and 11·1% respectively. The increase in area is generally attributed to better seasonal conditions in this year. The area estimated is the same as that of last year in South Kanara district. An increase in area is estimated for the other districts of the State except in the Nilgiris district where the area under cotton is little or negligible. Picking of cotton is in progress. The crop was affected by unfavourable weather conditions during the growing period in Tirunelveli district and by insect pest in Coimbatore and Malabar districts. The condition of the crop in other districts is generally satisfactory. The yield per acre is estimated to be higher than that of last year. The seasonal factor for State as a whole works out to 91% of the normal as against 90% for the previous year. On this basis, the total yield works out 264,400 bales of 392 lb. lint as against 213,200 bales of 392 lb. lint for the previous year and an average yield of 256,500 bales for the five years ending with 1952 – '53, representing an increase of 23·1% and 2·3% respectively. It is however too early to estimate the yield with accuracy as much will depend upon the future weather conditions and their effect on the second crop.

The estimated area and yield of cotton by varieties in the current year together with the corresponding figures for the previous year are given below:

Variety	Area in '00 acres		Yield in '00 bales of 392 lb. lint	
	1953 – '54	1952 – '53	1953 – '54	1952 – '53
Madras American (Irrigated)	1007	753	679	492
(Cambodia) (Unirrigated)	1198	920	303	233
Madras American (Irrigated)	421	266	287	173
(Cambodia Uganda) (Unirrigated)	544	346	140	87
Total Cambodia	3170	2285	1409	985
Uppam in Central districts	43	32	7	5
Nadam and Bourban	19	..	–*	..
Total Salems	62	32	7	5
Tirunelvelies (a)	1825	1664	431	401
Karunganni	3428	3294	777	741
Total	5253	4958	1208	1142
Grand Total	8485	7275	2624	2132

(* less than 50 bales). ((a) Includes Uppam and mixed Country Cotton grown in the South).

The wholesale price of cotton lint per standard maund of 82–2/7 lb. or 3200 tolas as reported from certain important market centres on the 1st May 1954 reveal an increase of 8·9% in the case of Tirunelvelies, 1·3% in the case of Coimbatore Karunganni, a decrease of 0·2% in the case of Nadam Cotton. -[Director of Statistics ,Madras].

Weather Review — For the month of June, 1954.

RAINFALL DATA (IN INCHES)

Division	Station	Total rainfall for the month	Departure from normal	Total since 1st January
North	Madras (Meenambakkam)	0·8	— 1·1	3·7
	Tirurkuppam*	1·1	— 1·3	4·1
	Vellore	1·5	— 1·3	7·2
	Gudiyatham*	1·0	— 1·0	6·1
East Coast	Palur*	0·3	— 1·7	7·7
	Tindivanam*	0·6	— 0·8	8·7
	Cuddalore	0·7	— 0·7	15·0
	Nagapattinam	0·6	— 0·6	7·2
	Aduturai*	2·2	+ 1·2	10·1
	Pattukottai*	1·5	+ 0·7	16·4
Central	Salem	5·7	+ 2·6	11·7
	Coimbatore (A. M. O.)*	1·5	+ 0·4	11·9
	Coimbatore	1·1	— 0·4	15·3
	Tiruchirapalli	0·1	— 1·7	11·4

Division	Station	Total for the month	Departure from normal	Total since 1st January
South	Madurai	0·4	— 1·2	12·1
	Pamban	—	— 0·2	11·7
	Koilpatti*	—	— 0·3	18·2
	Palayamcottai	—	— 0·4	10·5
	Ambasamudram*	0·3	— 1·0	18·7
West Coast	Trivandrum	7·7	— 5·5	30·1
	Fort Cochin	36·6	+ 8·1	64·7
	Kozhikode	54·4	+19·6	74·7
	Pattambi*	31·2	+ 4·8	40·3
	Taliparamba*	47·4	+10·1	59·7
	Wynaad*	19·6	+ 5·4	29·7
	Nileshwar*	60·4	+21·0	74·7
	Pilicode*	53·3	+15·4	66·9
	Mangalore	46·2	+ 6·0	56·5
	Kankanady*	46·4	+ 8·1	55·0
Hills	Kodaikanal	4·0	— 0·2	29·1
	Coonoor*	1·3	— 1·3	29·2
	Ootacamund*	3·6	— 0·7	15·3
	Nanjanad*	7·0	+ 0·2	16·5

Note:—1. * Meteorological Stations of the Madras Agric. Dept. 2. — = No rainfall.

The month began with a strong and active monsoon along the West Coast, which became weak on the third day. On the fourth day it regained and kept its activity unabated for five days. On the ninth day it was slightly weak, but on the very next day became active again along the West Coast, and remained so for two days. From the twelfth day on-wards the monsoon remained weak for three days. For seven days from the fifteenth it was fairly active along the West Coast. Again it became weak and continued to be so for four days. Due to a shallow depression in the West Central Bay of Bengal off the Orissa Coast on the 26th day of June the monsoon again became strong and continued its vigour till the end of the month. The general performance of the monsoon along the West Coast and in the districts of Salem, Coimbatore and Tanjore was fairly good. But in other parts of the Madras State it was rather bad, thereby causing anxiety to the farmers as to whether the South-West monsoon rains would fail completely. The note-worthy rainfalls and the zonal rainfall for the month are furnished hereunder : –

Note-worthy Rainfalls for the Month

Date	Name of Place	Rain-fall	Name of Zone	Av. rain-fall for June	Dep. from normal	Remarks
1/6/54	Fort Cochin	6·0″	North	1·1	— 1·2	Below normal
5/6/54	Mangalore	5·0″	East Coast	1·0	— 0·3	,,
11/6/54	Calicut	9·3″	Central	2·1	+ 0·2	Just above normal
13/6/54	Salem	2·0″	South	0·1	— 0·6	Below normal
18/6/54	Alleppey	4·0″	West Coast	40·3	+ 9·3	Above normal
			Hills	4·0	— 0·5	Below normal

Agricultural Meteorology Section,
Lawley Road P. O.,
Coimbatore, 12—7—1954

C. B. M. & M. V. J.

DEPARTMENTAL NOTIFICATION.

Gazetted Service-Postings and Transfers.

Name	From	To
Abdul Samad	Paddy Specialist, Coimbatore	Supdt. A. R. S. Palur
Fuzlallkhan	Asst. Fruit Specialist, Coonoor	Supdt., Wynad Colonisation Scheme, Wynad
Govinda Kurup K.	P. A. to D. A. O. Salem	D. A. O. Trichy
Kunhikoran Numbiar	Asst. Millet Specialist, Coimbatore	To be in additional charge of Millet Specialist
Mohd. Basheer	Asst. Entomologist, Coimbatore	Asst. Entomologist, Civil Supplies, Madras
Narayanaswami P. S.	Asst. Entomologist, Civil Supplies, Madras	Asst. Entomologist, Civil Supplies, Madras
Ramaswami K.	Supdt., A. R. S. Aduthurai	Paddy Specialist, Coimbatore
Rajarathnam Chetty S.	Agronomist, Siruguppa	Spl. D. A. O. Tanjore
Sahadevan P. C.	S. D. O. Vellore	Asst. Paddy Specialist, Pattambi
Srinivasan V.	Asst. Paddy Specialist, Pattambi	Supdt., A. R. S. Aduthurai
Santhanakrishnan B.	D. A. O. on leave	Asst. Marketing Officer, Madras
Samuel Sundararaj J.	Asst. Fruit Specialist	Asst. Fruit Specialist, Coonoor
Tirumalacharya N. C.	Spl. D. A. O. Salem	Reginonal Campaign Officer, Madras
Uthaman P.	On leave	S. D. O. Vellore

Upper Subordinates-Postings and Transfers.

Name	From	To
Arunachalam T.	S. D. A. Millets, Coimbatore	P. A. to D. A. O. Tanjore
Anavaratham L.	Millet Asst. Koilpatty	Millet Asst. Coimbatore
Ahamad Bavappa K. V.	Paddy Asst. Patambi	Paddy Asst. Aduthurai
Aaron D. S.	Cotton Asst. Koilpatiy	Cotton Asst. Coimbatore
Balasubramaniam	A. A. D. Katpadi	A. D. Vellore

Name	From	To
Baskaran A. R.	Exten. Officer, Mudiri	A. D. Papanasam
Balakrishnan Alwa K. N.	A. D. Karkal	Asst. in Tuber crop, Mangalore
Bindhumadava Rao	Paddy Asst. Aduthurai	Paddy Asst. Pattukottai
Chandrasekharan N. R.	Oil Seed Asst. Tindivanam	Oil Seed Asst. Selam
Chandrasekharan T. K.	Asst. in Chemistry	A. D. Pollachi
Doraiswami G.	A. D. Gobichettipalayam	A. D. North Arcot Dist.
Dorairaj V.	Asst. in Millets, Coimbatore	Asst. Millets, Koilpatty
Doraiswami K.	On leave	Spl. A. D. Nellikuppam
Dakshinamurthy	A. D. Trichengode	P. A. to D. A. Cuddalore
George P. F.	A. D. Tirumangalam	Extension Officer, Panruty
Gopalakrishnan R.	Meteorology Asst. P. T. B.	Paddy Asst. Pattambi
Gobinath M.	Ginger Asst. Pattambi	S. D. A. Palghat
Gopalakrishnan P.	S. D. A. Madurai	Agrl. Instructor, Koilpatty
Govindan Nair K. V.	A. D. Cannanore	Agrl. Instructor, Taliparamba
Gopalakrishnan K.		A. D. Karkal
Guruswami Raju V. D.	Cotton Asst. Koilpatti	Cotton Asst. Coimbatore
Hariharan R.		A. A. D. Valavanur
James K. I.	Cotton Asst. Coimbatore	Cotton Asst. Pattambi
Krishnaswami Sarma N. C.	Coconut Nursery Asst. Marudur	F. M. Central Farm, Coimbatore
Krishnaswami	A. D. Chengam	A. A. D. Kaveripakkam
Kuriakose T. F.	A. A. D. Ramanathukara	A. D. Peruntalamanna
Kumaraswami G.		A. D. Villupuram
Kandaswami T. K.	F. M. Pattukottai	Asst. in Mycology, Coimbatore
Kalimuthu M.	A. D. Lalgudi	Agrl. Instructor, Coimbatore
Kuppuswami V. N.	Extension Officer in Agriculture, Krishnagiri	S. D. A. Tanjore
Krishnamurthy J.	Cotton Asst. Avanashi	Cotton Asst. Koilpatti
Lakshminarayanan	Spl. A. D. Srivilliputhur	A. D. Thenkasi
Meenakshisundaram M. N.	P. A. to D. A. O. Vellore	P. A. to D. A. O. Madurai
Mohd. Ibrahim P. A.	Coconut Nursery Asst., Pattambi	Coconut Nursery Asst. Marudur

Name	From	To
Mukundan T. K.	P. P. A. Shoranur	S. D. A. Shoranur
Murugesan G.	P. A. to D. A. O. Sattur	Agrl. Instructor, Pattukottai
Mohd. Fathahuddin	Block Extension Officer, Tirukalukundram	A. A. D. Rajapalayam
Muthuswami T. D.	P. A. to D. A. O. Cuddalore	P. A. to D. A. O. Trichy
Mohd. Sultan Mohideen		A. D. Tirumangalam
Muthuswami P. N.	A. D. Pollachi	Agrl. Instructor, Central Farm, Coimbatore
Mahadeva Iyer S.	S. D. A. Pattukottai	Agrl. Instructor, Aduthurai
Manuel P. J.		Potato Asst. Nanjanad
Marappan P. V.	Cotton Asst. Coimbatore	Cotton Asst. Koilpatty
Natarajan G. K.	Ento. Asst. Aduthurai	Spl. A. D. Sugarcane, Karur
Narayanan A.	S. D. A. Shoranur	A. A. D. Ramanathukara
Narayanankutty T.	A. D. Perintalmanna	P. P. A.-Ento. Shoranur
Nagarajan L. R.	Ento. Asst. Aduthurai	Ento. Asst. Coimbatore
Narayanamurthy C. C.		A. A. D. St. Thomas Mount
Narayanankutty K. G.	A. A. D. Shoranur	A. D. Cannanore
Nagarajan C.	Cotton Asst. Trichengode	Cotton Asst. Satyamangalam
Padmanabhan S.	Soil Conservation Asst. Bellary	Soil Conservation Asst. Dharapuram
Pattabiraman R.	A. D. Papanasam	Spl. A. D. Karur
Peter S. D.	Cotton Asst. Coimbatore	Cotton Asst. Periakulam
Ramachandra Poduval	Asst. in Paddy P. T. B.	A. A. D. Shoranur
Ramachandran P. K.	A. D. Vellore	A. A. D. Katpadi
Rajagopal Reddy V.	Paddy Asst. Tirur	Paddy Asst. Pattukottai
Ramachandran S.	Spl. A. D. Sugarcane, Vellore	A. D. N. Arcot Dt.
Ramachandran M.	Oil Seed Asst. Salem	Oil Seed Asst. Tindivanam
Rangaswami Reddy S.	Extension Officer, Sankarankoil	A. D. Srivaikuntam
Rama Prasad S.		Paddy Asst. Aduthurai
Ramalingam M.		Sugarcane Asst. A. R. S. Gudiyattam
Ramadas Kamath M.		A. A. D. Taliparamba
Rajagopalan K.	Paddy Asst. Coimbatore	Paddy Asst. Aduthurai
Rajagopalan D. S.	Cotton Asst. Koilpatty	Cotton Asst. Coimbatore

Name	From	To
Subramaniam T. W.	A. A. D. Palur	A. D. Chengam
Subbiah Pillai R.	A. D. Tenkasi	A. D. N. Arcot Dt.
Sankaranarayanan R.	Paddy Asst. Coimbatore	Paddy Asst. Tirurkuppam
Sowmini C. K.	Asst. in Mycology, Coimbatore	Asst. in Mycology
Shanmugavinayagam	A. D. Srivaikuntam	Extension Officer, Sankarankoil
Sitharaman S.	A. D. Sankarankoil	Agrl. Instructor, T. Kallupatty
Sethuraman M. S.	A. D. Namakkal	P. A. to D. A. O. Salem
Seetharaman	S. D. A. Sattur	P. A. to D. S. O. Sattur
Santhanam S. R.	A. D. Dharapuram	S. D. A. Millets, Coimbatore
Sambandam R.	On leave	Cotton Asst Coimbatore
Sethumadavan P.		Potato Asst Nanjanad
Sankaranarayanan C. V.	Paddy Asst. Coimbatore	Paddy Asst. Pattambi
Shanmugam T. S.	Paddy Asst. Adt.	Paddy Asst. Coimbatore
Thulasidas G.	Botany Asst. Burliar,	Ginger Asst. Pattambi
Thiruthuvaraj K. J.		P. P. A. Myco. Trichy
Thiruvenkataswami K. R.	Soil Conservation Scheme, Ketty	Extension Officer in Agrl. Tiruchengode
Venkataraman N. K.		P. P A. Entomology, Trichy
Venkataramani	A. D. Salem	A. D. Tiruvengadu Firka
Velayudam H. S.		A. D. North Arcot Dt.
Venkatachalam K. M	On leave	A. A. D. Chidambaram
Venkataraman R.	Paddy Asst. Aduthurai	Paddy Asst. Coimbatore
Vaman Bhatt	Cotton Asst. Pattambi	Cotton Asst. Avanashi